Water Leakage Location Detector
AD-AS-1LDMA
Operation Manual

System Equipment Division
Electronic Material & System Equipment Group
Tatsuta Electric Wire & Cable Co., Ltd.

<<<Important Safety Precautions>>>

⚠ Warning

Failure to operate this water leakage location detector in compliance with the following warnings may lead to fatality, serious injury, fire, electric shock, or detector failure.

⚠ Precautions!

⚠ Strictly Prohibited!

- ☐ Never modify or disassemble this detector.
- ☐ Allow only qualified persons to carry out installation work inspection of this detector.
- ☐ Do not touch this detector with wet hands.
- ☐ When performing maintenance on this detector, wipe it with dry rags instead of using organic solvent.

⚠ Checkpoints!

- ☐ Check the rated voltage and the detector supply voltage before installation.
- ☐ When installing and making electrical connections to this detector, follow the instructions in the operation manual.
- ☐ When inspecting and carrying out maintenance on this detector, follow the instructions in the operation manual.
- ☐ When using control output contacts, check the contact rated load in the operation manual.

⚠ Do not install the detector in the following locations!

- ☐ Locations easily accessible to the general public
- ☐ Locations close to sources of vibration, organic gas or strong electromagnetic induction
- ☐ Locations subject to excessive waste and dust
- ☐ Locations where there is a possibility of exposure to water, or high temperature and humidity

Warranty

Before shipping, this product is subjected to strict quality control and inspection. In the event of spontaneous failure resulting from defective manufacturing, we will repair or replace it according to the following provisions.

Warranty Provisions

1. Warranty period (one year after the delivery date of the product)
   Should the product fail during the warranty period under normal usage according to the operation manual, we will repair or replace it free of charge. Please contact us using the contact information given below.
2. Cases not covered by the warranty
   (1) After the period of warranty
   (2) Failures due to incorrect usage, and unauthorized repairs and modifications
   (3) Failures or damages due to moving, dropping etc. after purchase
   (4) Failures or damages due to fire and natural disasters
   (5) Failures not attributable to this product
   (6) Fees for on-site service (visiting fee and technical fee)

Contact information:

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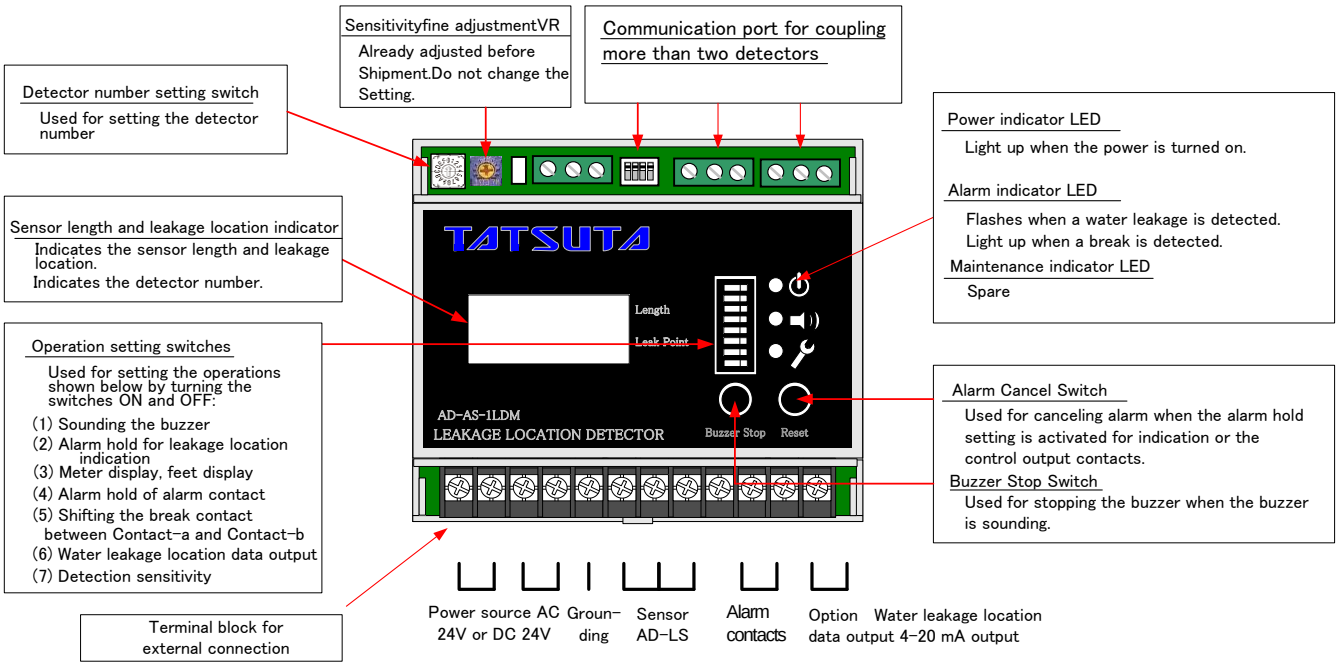
Table of contents

Thank you very much for purchasing the Water Leakage Location Detector (AD-AS-1LDMA).
Before using, read this operation manual carefully to ensure correct operation. Keep this manual in a convenient place for quickreference.

1. Explanation of Individual Parts of Water Leakage Location Detector

The Water Leakage Location Detector (AD-AS-1LDMA) has the functions described in Drawing 1.



Drawing 1 Explanation of Individual Parts of Water Leakage Location Detector

2. Installation and Handling Precautions

2-1 Installation

The Water Leakage Location Detector (AD-AS-1LDMA) shall be securely installed in a strong housing, on the wall, etc. inside a building. Be sure to follow the following instructions when installing this product.

1) Avoid installing the detector in any location subject to high temperature and high humidity, excessively dusty environments and corrosive gas environments.
2) Install the detector in a location that is free from vibration, away from sources of noise such as power switch, and convenient for quick maintenance and inspection.
3) Install the sensor using adhesive stickers, adhesive tapes, etc. according to location and environment.
4) Do not insert foreign matters, including drivers, into gaps in the case.
5) Do not use the sensor as electric wire.
6) Never use sensors other than our product “AD-LS Sensor” and electric wire. This will cause serious deviation in the location detection function.

2-2 Handling Precautions

1) Use the detector in an environment with a temperature range between -10 and 50˚C and a humidity range between 35 to 95%*. *86% or more is the storage humidity.
2) Do not install the detector in any location close to sources of vibration and harmful gas, and strong electromagnetic inductive power sources. This may cause malfunction and failures.
3) After installation, be sure to conduct tests in conformance with the operation check items described in Chapter 6.

3. Maintenance and Inspection

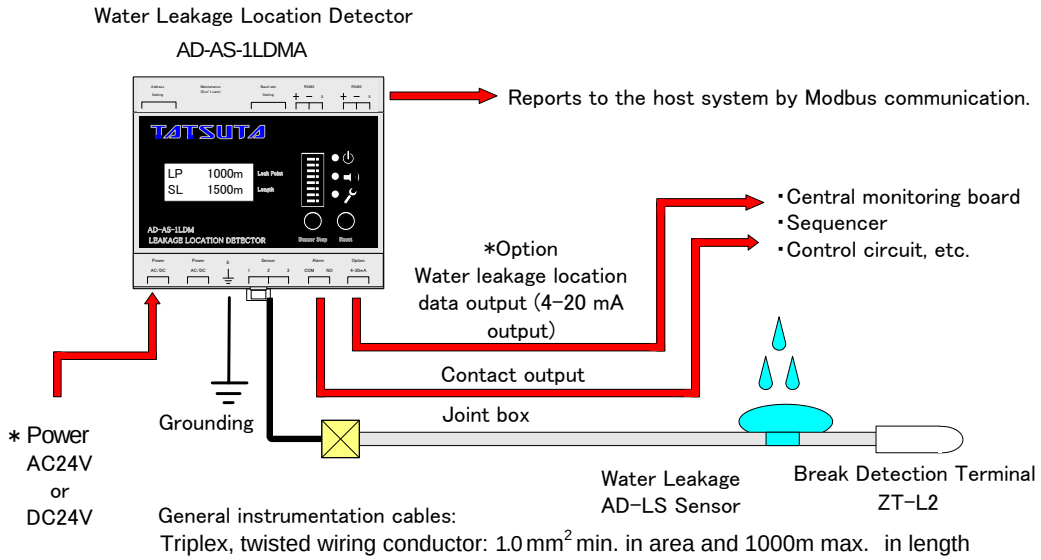
◇ When inspecting the facilities, conduct inspections in conformance with the operation check items described in Chapter 6.
Note) During inspection of the detector, the control output contacts are functioning, so if the control output contacts are used, disconnect the wiring or connect temporary wiring in order not to affect other devices.
◇ Be careful to prevent oil-based substances, such as wax, from adhering to the sensor; this may repel water and interfere with correct detector operation.
◇ If the sensor is tainted with water absorbing substances, electrically conductive dirty water, etc., replace it with new one.

4. Configuration of Water Leakage Location Detecting System

The Water Leakage Location Detection System consists of the following components:

1) Water Leakage Location Detector (AD-AS-1LDMA)
2) Water Leakage Sensor (AD-LS)
3) Break Detection Terminal (ZT-L2)

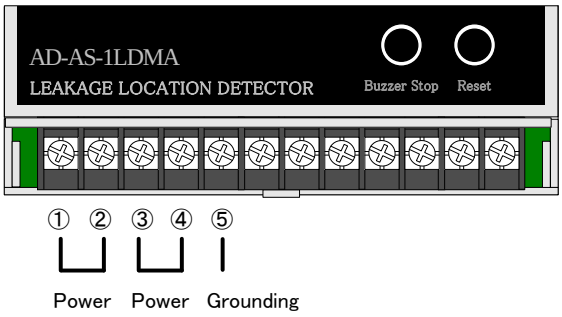
Each connection of terminal block is described in Chapter 5.



Drawing 2 Water Leakage Location Detecting System

5. External Connection

AD-AS-1LDMA has a terminal block as shown in Drawing 3. (Make connections securely in conformance to Sections 1 to 5.)



Drawing 3 Layout Drawing of Terminal Block

5-1 Power Connection

Before connection, check that the power supply voltage is within the range of use and check the polarity, then connect it securely to the terminal block.

* Inputting a power supply voltage outside the range of use may cause malfunctions and failure of the detector, so care should be taken.

① AC 24V (DC 24V +)
② AC 24V (DC 24V -)
③ AC 24V (DC 24V +)
④ AC 24V (DC 24V -)

* ③ and ④ is terminal block for transition wiring. Inside the detector, ① is connected to ③, and ② is connected to ④.

Connecting the power source to ①, ③ or ②, ④ may cause short, so care should be taken.

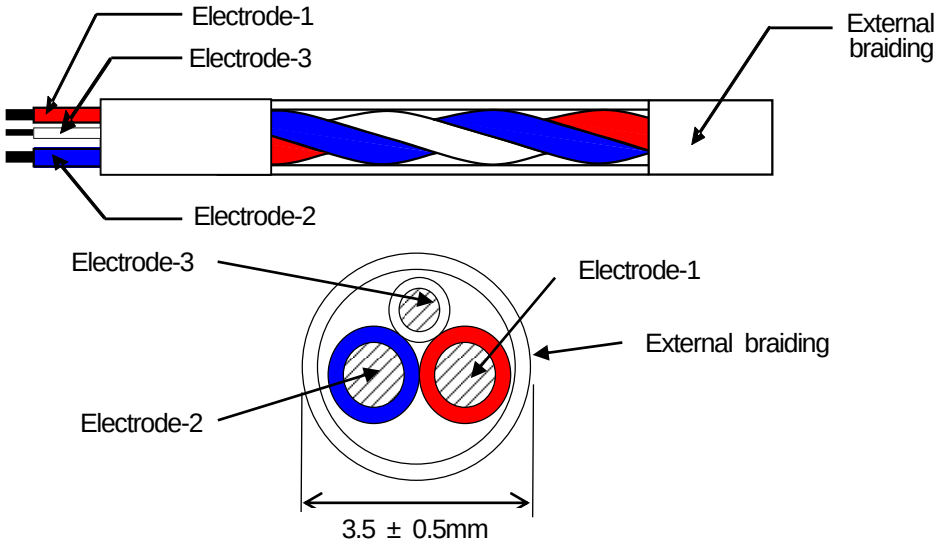
5-2 Ground Connection

Be sure to ground for noise prevention.

5-3 Water Leakage Sensor Connection

The structure and configuration of the water leakage sensor (AD-LS Sensor) used for the Water Leakage Location Detector (AD-AS-1LDMA) are shown in Drawing 4 and Table 1.

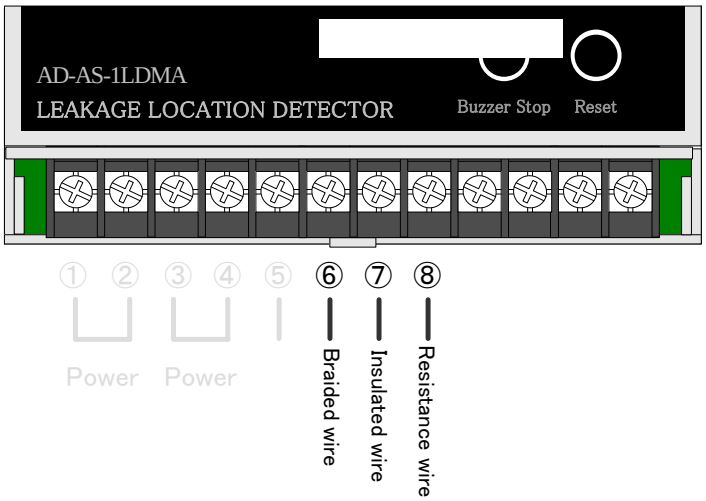
* Shapes and functions of each wire vary, so extra care should be taken when connecting it to the detector. (Refer to Drawing 5.)
  Incorrect wiring will result in inaccurate indication of water leakage locations or break alarm output.
* While carrying out wiring, make sure that the power is switched off.



Drawing 4 AD-LS Sensor Structure

Table 1 AD-LS Sensor Configuration

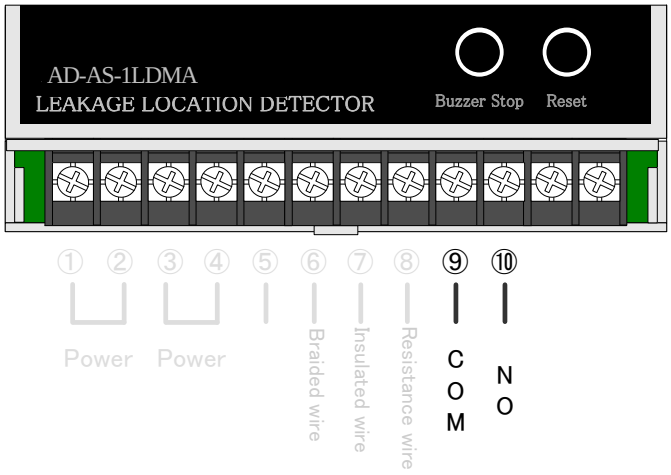
Element	Configuration
Braided wire	0.33mm^2 tinned soft copper wire covered with red plastic braided thread
Insulated wire	0.5mm^2 tinned soft copper wire insulated with blue plastic
Resistance wire	φ0.4 resistance wire covered with white plastic braided thread
External braiding	White plastic braided thread



Drawing 5 Terminal Block for Sensor Connection

5-4 Control Output Contact Connection

There are break output connections (Contact a), use them if external control is needed. (Refer to Drawing 6.)



Drawing 6 Control Output Contact

Alarm contacts COM-NO: Closed when a break is detected.

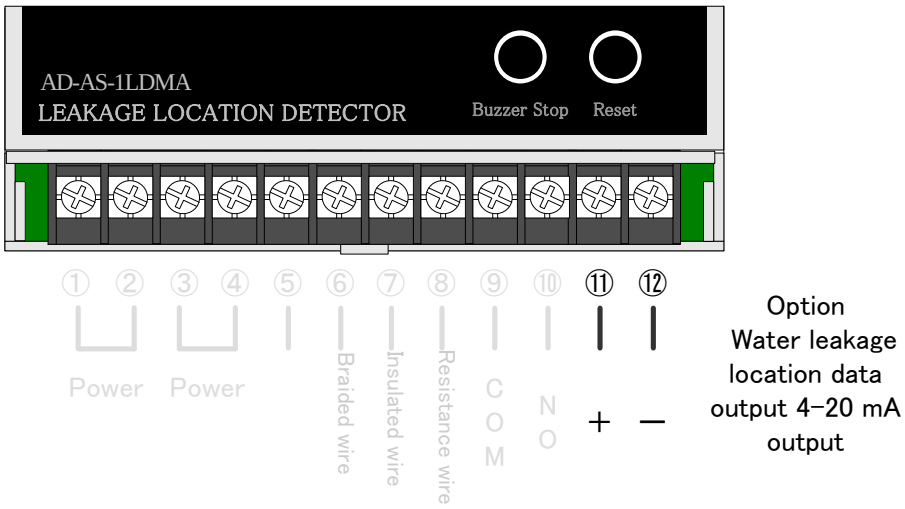
* Regarding contact operation
  Changing operational setting switches shifts Contact a to Contact b. (Refer to Drawing 3.)

Water Leakage Location Data Output Connection

5-5-1 Connection

The AD-AS-1LDMA has a function that outputs the water leakage location by DC electrical current. (Option)

* Use an analog input device with an input resistance of 500 Ω or lower.



Drawing 7 Water Leakage Location Data Output Connection

(Output specifications)

Normal sensor output current = 4 (mA)

Sensor output current in the case of sensor break detection = 20 (mA)

Output current in the case of water leakage detection = 6 + 0.03 x water leakage location indication (mA)

5-5-2 Abnormal Water Leakage Location Data Output

In the case of abnormal water leakage location data output, an indication of “E01” is added on the LED. (Refer to Attached Drawing 4.)

This may result from the causes described below. Check the facilities.

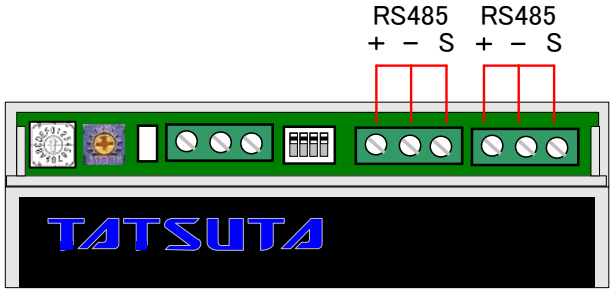
1) Detector: Wiring and/or connection between external analog input devices are broken.

2) The input resistance for the external analog input devices is more than 500 Ω.

If there is no problem with the items above, the detector may be out of order. Contact the manufacturer.

5-6 RS485 Communication (Modbus/RTU) Connection

The connection terminal block that communicates with the host system is as follows. (Refer to Drawing 9)



Drawing 8. RS485 connection terminal block

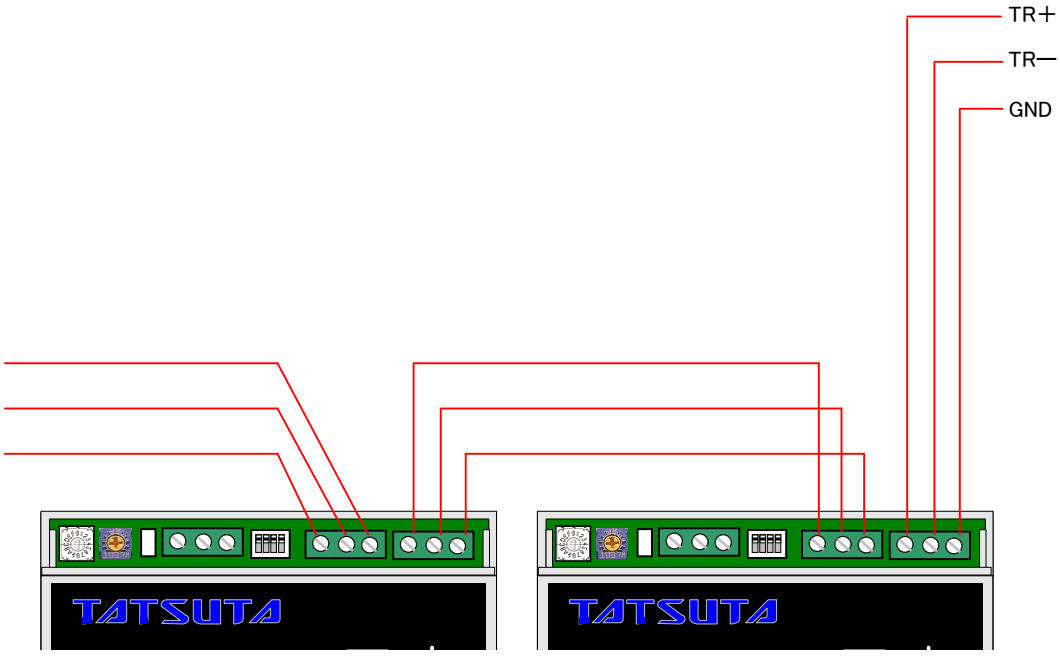
+ Terminal: SD / RD + (hot side)

- Terminal: SD / RD + (cold side)

S terminal: GND

Note) Each + terminal and - terminal are internally connected.

To facilitate the connection of multiple units, two pairs of terminals were equipped.



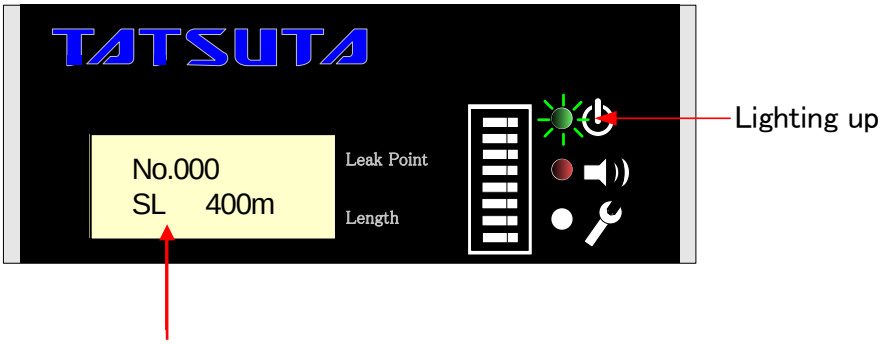
Drawing 9. RS485 wiring image

6. Operation Check

6-1 Power-On

When the detector is powered on, the Power Indicator LED and the LCD Backlight are Lighting up. (Refer to Drawing 10.)

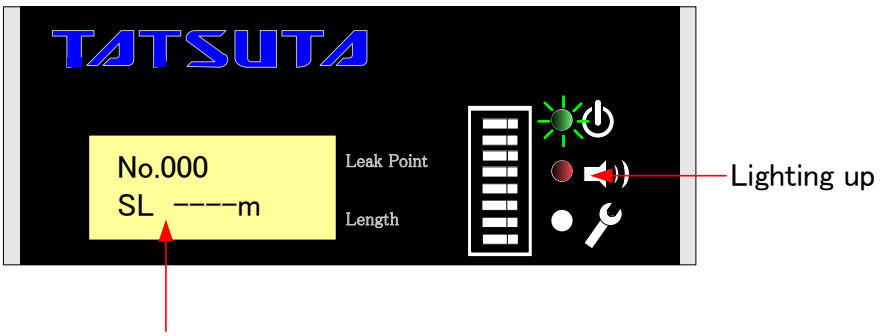
In the case in which either or both of the LEDs does not light up, the detector may be out of order. Power off the detector promptly and contact the manufacturer.



Drawing 10 Power-On Operation

6-2 Check for Break Detection Function

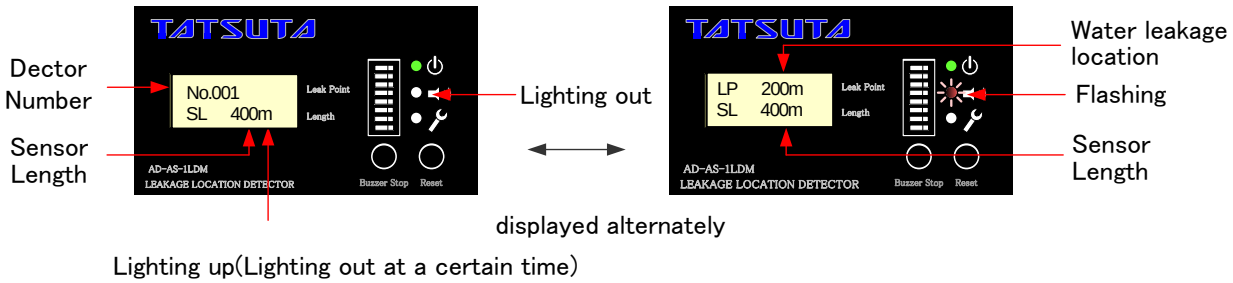
1) **After powering off the detector**, remove the water leakage sensor from the trunk terminal block and then power on the detector.
2) The buzzer sounds, the Alarm Indicator LED flashes and the contacts (for break detection) function.
3) LCD indicates "----m". (Refer to Drawing 11.)
4) After the operation check, **power off the detector** and then connect the sensor to the terminal block again.



Drawing 11. Indication in the Case of Break Detection¥

6-3 Check for Water Leakage Detection Function

1) Drop tap water on the sensor.
2) The buzzer sounds, the Alarm Indicator LED lights up and the contacts (for water leakage detection) function.
3) LCD indicates as shown in Drawing 12.
   Example: In the case in which a sensor with a length of 1500 meters is connected and a point at 1000 meters is wetted.
4) Wipe the tap water dropped on the sensor with dry rags, etc. and check that the water leakage status returns to normal.



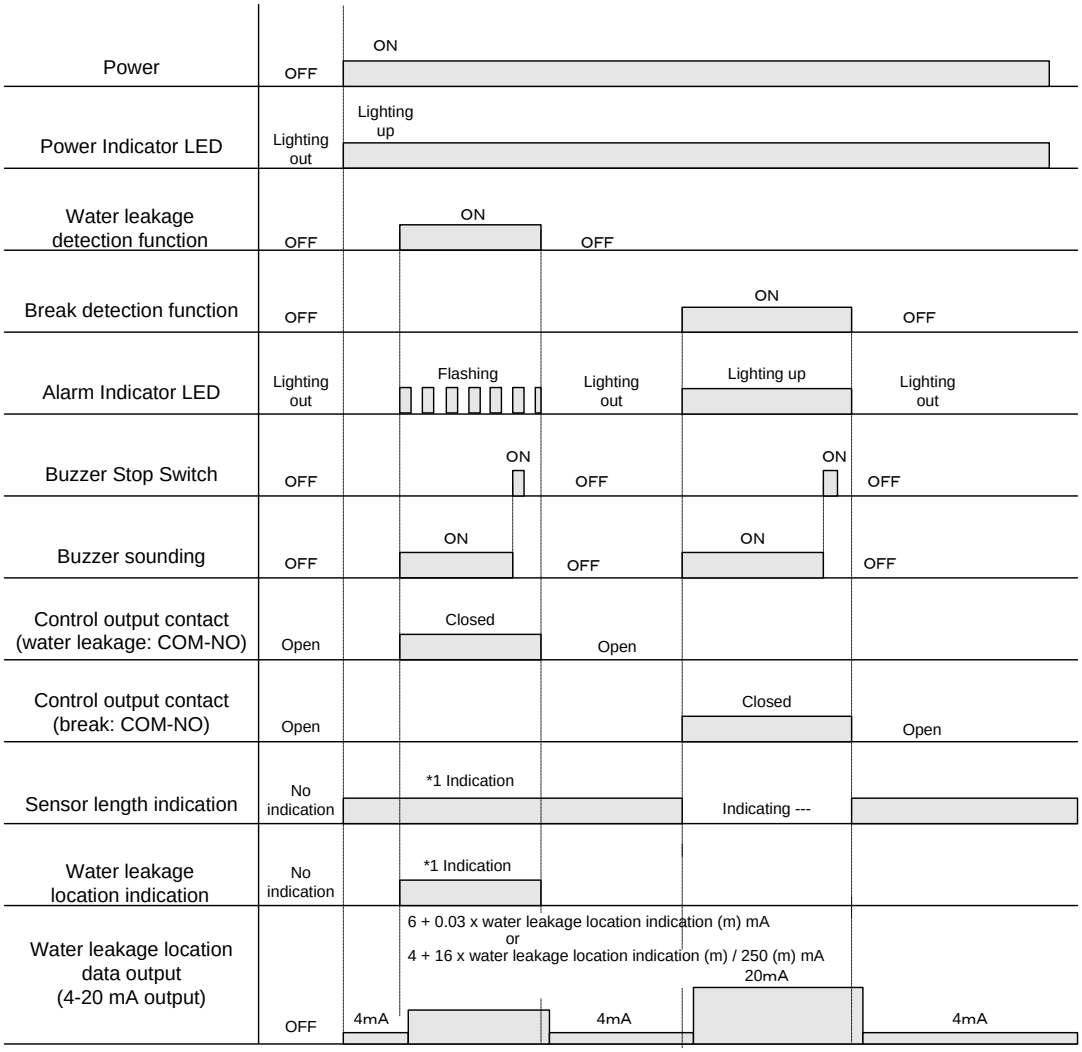
Drawing 12 Indication in the Case of Water Leakage Detection

7. Operation Chart

7-1 Standard Operation Chart

(Factory setting)

For the operation chart, refer to Drawing 13.



*1 The sensor length and the water leakage location is indicated alternately.

Drawing 13 Operation Chart-1

Regarding Buzzer

Pressing the buzzer stop switch stops the buzzer.

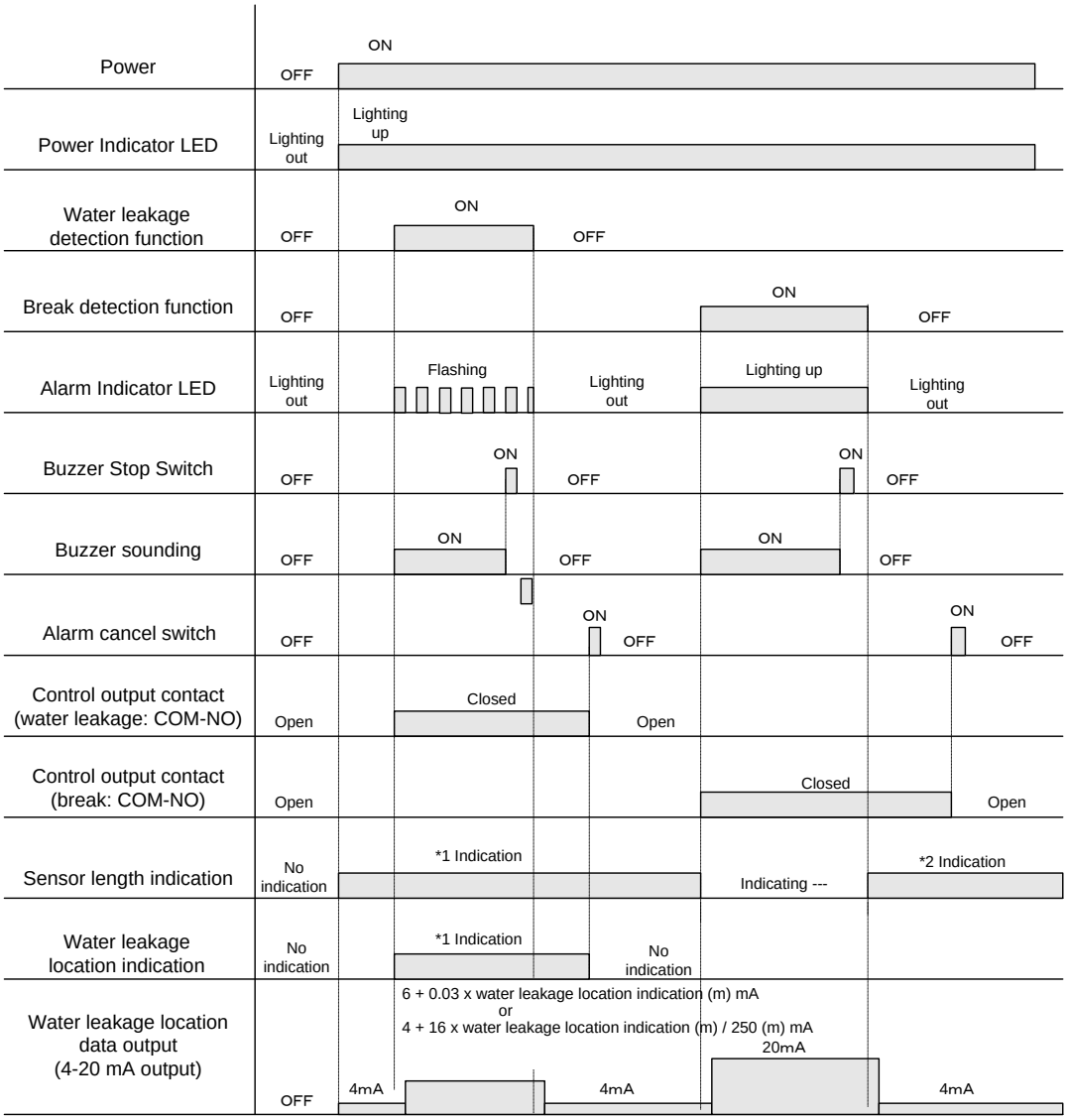
When the system detects another water leakage or a break, the buzzer sounds again. Turning No.1 operational setting switch ON prevents the buzzer from sounding at any time.

It is possible to set the buzzer from the host system by the Modbus communication.

7-2 Operation Chart When Alarm Hold Setting is Activated

Changing operational setting switches activates the alarm hold setting for indication and control output contacts. For the Operation Chart, refer to Drawing 14.

It is possible to set the control output contact from the host system by the Modbus communication.



*1 The sensor length and the water leakage location are indicated alternately. (Refer to Attached Drawing 4)
*2 For the break indication, the alarm status is not held.

Drawing 14 Operation Chart-2

Regarding the operation when the alarm hold setting is activated

When the alarm hold setting is activated, the alarm status is held until the cancel switch is pressed.

Electric power failure or power-off returns the contact operation status to that when the power source is shut off.

Regarding the Alarm Indicator LED

The Alarm Indicator LED does not maintain alarm status. The Alarm Indicator LED goes out when the system detects recovery from water leakage status and break status.

If the Alarm Indicator LED continues to flash even after the water leakage sensor is wiped with rags etc., this indicates that water leakage may occur at multiple locations.

After completely drying the water leakage sensor at the location that the indicator displays, press the alarm cancel switch.

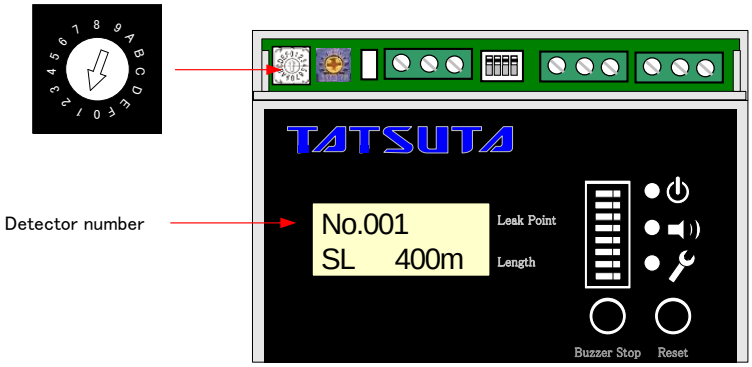
* If drying is insufficient, deviation may occur between the location displayed by the indicator after the alarm cancel switch is pressed and the actual water leakage location.

8. Indication of Detector number

The Detector number, which is used when communicating to the host system, is set by use of the rotary switch below.
Setable the range of the Detector number is between 1 and 15 by use of the rotary switch.

* The factory setting is 0 (no indication).

When setting the 16 to 127, set by operating “Alarm Cancel Switch” and “Buzzer Stop Switch”.
See the accompanying sheet for details.
The Detector number is indicated on the upper left of the LCD.



Drawing 15 Indication of Detector Number

9. Detection Sensitivity Setting

Changing operational setting switches changes the detection sensitivity level.

* The water leakage sensor detects water leakage even it is caused by only a small amount of water (condensation, for example). Therefore, if the sensor is installed in a location subject to high temperature and high humidity, set the sensitivity level lower.

* In the case in which it is necessary to detect fluid with high electrical resistance, such as pure water, in an environment where the temperature and humidity are stable, such as a clean room, it is recommended to set the sensitivity level high.

10. Buzzer Setting

Changing operational setting switches changes not to sound the buzzer.
It is possible to change the above setting from the host system by the Modbus communication.

11. Specifications

11-1 Ratings

For the ratings, refer to Table 2.

Table 2 Ratings

Item	Specification
Rated voltage	AC24V or DC24V
Supply voltage fluctuation	± 10% of each
Power consumption	5W max.
Control output contact	See Section 11-2 Control Output Contact Specifications.
Sensor applied voltage	AC12.5V (maximum value)
Working ambient temperature	-10 to 50 ˚C (no icing)
Working ambient humidity	35 to 95%RH *(no condensation) *86% or more is the storage humidity.

11-2 Control Output Contact Specifications

For the control output contact, refer to Table 3.

Table 3 Control Output Contact Specifications

Item	Resistance load	Inductive load
Rated load	AC 220V, 0.2 A DC 24V, 2.0 A	AC 220V, 0.1 A DC 24V, 1.0 A
Minimum applied load	DC 10mV, 10μA (reference value)	

(Relay contact: G6E-134P-US Catalogue values by OMRON Corporation)

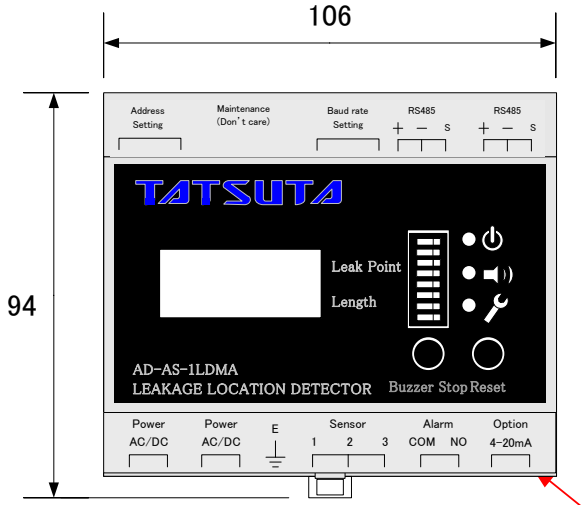
11-3 Performances

For performances, refer to Table 4.

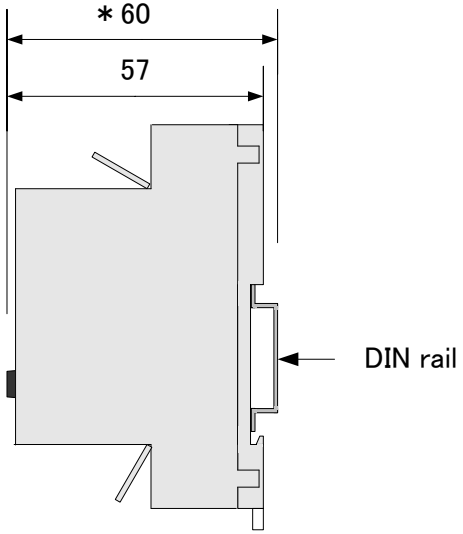
Table 4 Performances

Item	Specification			
Number of sensor circuit	1			
Length of sensor connection	1 to 1500 m			
Detection sensitivity level setting	Low	Standard	High	Highest
Water leakage detection sensitivity	10 ± 2.0kΩ	25 ± 2.5kΩ	50 ± 5.0kΩ	100 ± 10.0kΩ
Sensitivity in the case of recovery from water leakage	16 ± 3.0kΩ	37 ± 3.7kΩ	68kΩ ± 6.8kΩ	125 ± 12.5kΩ
Detection accuracy	1 to 100 m: ±1 m 101 to 400 m: sensor length ± 1%			
Surface panel operation switch function	Buzzer stop switch: 1			
	Alarm cancel switch: 1			
Surface panel LED indication	Power source indication, green: 1 (lighting up)			
	Alarm indication, red: 1 (flashing in the case of water leakage detection) (lighting up in the case of break detection)			
	Meintenance indication: 1			
Surface panel LCD indication	Modbus Address: 1 to 127 Sensor length and water leakage location indication: meter display or feet display			
Surface panel operational setting switch	Used for setting change of indication, control output contacts, detection sensitivity level, etc. For details, refer to Attached Drawing 3.			
Alarm buzzer	Average sound pressure: 90 dB/10 cm (catalogue value by manufacturer)			
Control output contact	Contact Configuration	◇Contacts (For specifications, refer to Section 11-2.) Water leakage: 1 for 1a Break: 1 for 1a *Setting change of the operation switchs shifts to Contact b.		
Water leakage location data output	4-20 mA current loop output (external load resistance: 500Ω max.) x1 Under normal sensor conditions: 4 mA In the case of sensor break detection: 20 mA In the case of water leakage detection: 6 + 0.03 x water leakage location indication (m) mA ± 1% *Changing operational setting switches changes operation in the case of water leakage detection. (Refer to Attached Drawing 3.) In the case of water leakage detection: 16 x water leakage location indication (m) / 250 (m) + 4 mA ± 1%			
Withstand voltage	AC 1500V (50/60 Hz)/ 1 minute (between the power source terminal and the body case)			
Insulation resistance	10MΩ min. (With DC 500V Megger)/1 minute (between the power source terminal and the body case)			
Noiseproofing property	± 1000V Pulse width: 1μSEC (noise simulator)/1 minute (berween each phase and the grounding terminal) Power source: 2 kV, 5 kHz Sensor: 1 kV, 5 kHz *IEC61000-4-4			
Outside dimensions	(W) 106 x (H) 94 x (D) 57 (unit: mm) (Refer to Attached Drawing 1.)			
Weight and color	Approx. 260 g, gray			

Attached Drawing 1



*DIN rail mounting dimensions



Terminal block cover

Revision date	Prepared by	Checked by	Approved by	Reason for revision

Approved by	Checked by	Prepared by	Scale	−/−
			Unit	mm
			Prepared on	2014.12.01

TATSUTA Electric Wire & Cable Co., Ltd.

Drawing No.

Water Leakage Location Detector (AD-AS-1 LDMA) Outside Dimensions

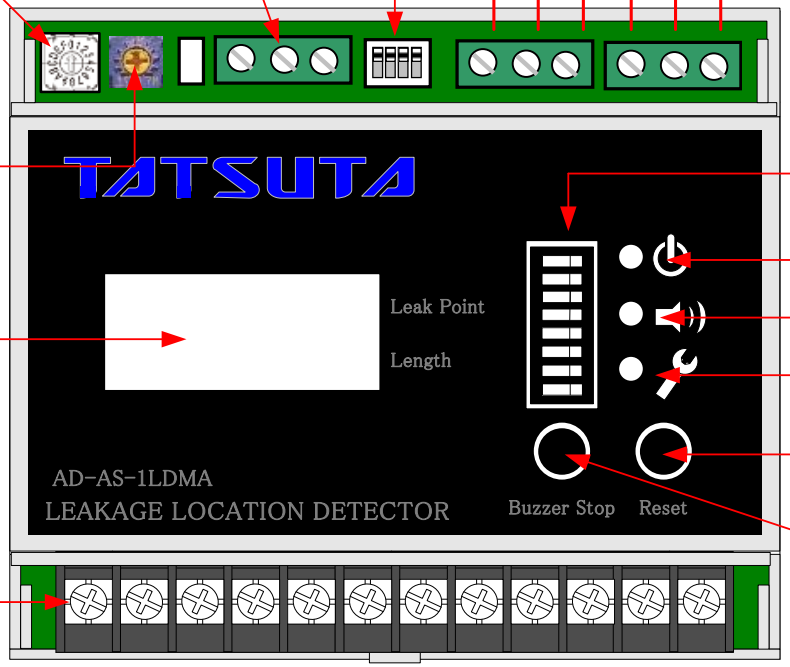
Attached Drawing 2

Communication speed terminal setting switch
* For Modbus communication use

Modbus address setting switch
(No. 1 to 15)

For maintenance use
(Do not use them.)

*Modbus RS485
Two terminals to which connections are made are available at each location. Making connections at one of the locations will activate the system.
Use the other for connection wiring.



Sensitivity fine adjustment VR
* This has already been adjusted before shipment.
Do not change the setting.

Operational setting switch

Power indicator LED

Alarm indicator LED

Maintenance indicator LED

LCD
The items to be displayed are as follows:
Modbus address
Sensor length
Water leakage point
Details of the error

Alarm cancel switch

Buzzer stop switch

Connection terminal board (M3)

Power source □ AC24V or DC24V				E	Sensor connection AD-LS			Alarm contact (* Contact 1a)		4-20 mA output	
+	—	+	—		Braded wire	Insulated wire	Resistance wire	COM	NO	+	—

* Power source
An AC 24 V input has no polarity.
The + and - symbols apply to a DC 24 V input.
Two terminals to which connections are made are available at each location. Making connections at one of the locations will activate the system.
Use the other for connection wiring.

* Contact operation
Contact a can be changed to Contact b by adjusting the setting of the operational setting switch.
(Refer to Attached Drawing 3.)

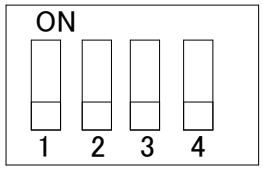
Revision date	Prepared by	Checked by	Approved by	Reason for revision

Approved by	Checked by	Prepared by	Scale	−/−
			Unit	mm
			Prepared on	2014.12.01

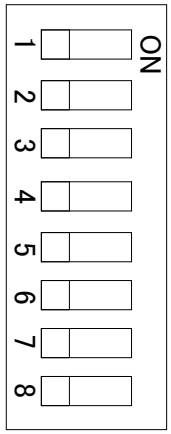
TATSUTA Electric Wire & Cable Co., Ltd.

Water Leakage Location Detector (AD-AS-1 LDMA) Explanation of Individual Parts

Attached Drawing 3



No	Operational setting	Explanation of operations * Make this setting before powering on.
1	OFF	Setting of the 8-bit switch on the surface OFF: valid setting; ON: invalid setting (setting carried out through Modbus communication)
2	OFF	Communication speed setting (2) (3) OFF - OFF : 4800bps ON - OFF : 9600bps OFF - ON : 19200bps ON - ON : 38400bps
3	OFF	
4	OFF	Terminal resistance setting OFF: not connected; ON: terminal connection



No	Operational setting	Explanation of operations * When the No.1 4-bit DIP switch is at OFF, the setting change is valid.
1	OFF	Buzzer sounding OFF: Activated ON: Not activated
2	OFF	Alarm hold for water leakage location indication OFF: Not available ON: Available
3	OFF	Switching between the meter and the foot indication OFF: Not available ON: Available
4	OFF	Alarm hold for the alarm relay OFF: Not available ON: Available
5	OFF	Alarm relay: Contact a/b operation OFF: Contact a ON: Contact b
6	OFF	Unassigned, fixed at OFF
7	OFF	Detection sensitivity shifting (7) (8) OFF - OFF Standard sensitivity Approx. 25kΩ ON - OFF Low sensitivity Approx. 10kΩ OFF - ON High sensitivity Approx. 50kΩ ON - ON Highest sensitivity Approx. 100kΩ
8	OFF	

* Changing the SW causes the operations of the indications and relays to change.
Note that inadvertently changing the SW may lead to an unintended operation.

Revision date	Prepared by	Checked by	Approved by	Reason for revision

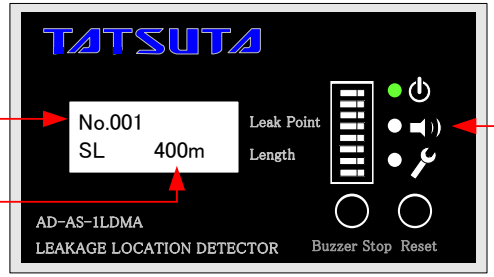
Approved by	Checked by	Prepared by	Scale	–/–
			Unit	mm
			Prepared on	2014.12.01

TATSUTA Electric Wire & Cable Co., Ltd.

Water Leakage Location Detector (AD-AS-1 LDMA) Explanation of the operational setting switch

Attached Drawing 4

Indication under normal sensor conditions

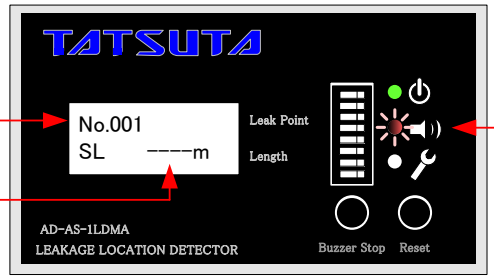


Modbus address →

Sensor length →

← OFF

Indication in the case of break detection

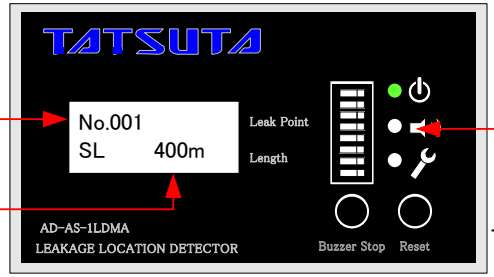


Modbus address →

Indication of a break
– – – –

← LIT

Indication in the case of water leakage detection

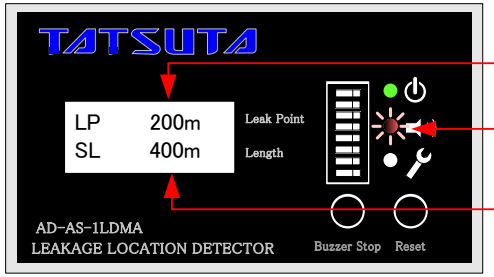


Modbus address →

Sensor length →

← OFF

↔ The two indications alternate.

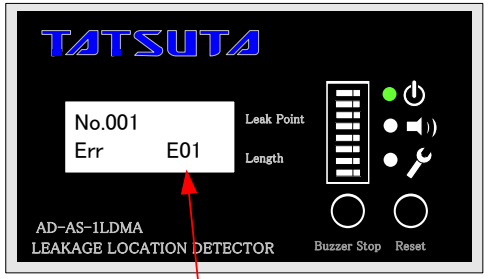


← Leakage point indication

← Flashing

← Sensor length indication

Indication of an abnormality in the water leakage detection data



An indication of “E01” is added in the following cases:
①The wiring or connection between the detector and the external analog input device is broken; or the input resistance is 500 Ω or more;
②The internal power source inside the detector for the 4-20 mA output fails.

Revision date	Prepared by	Checked by	Approved by	Reason for revision

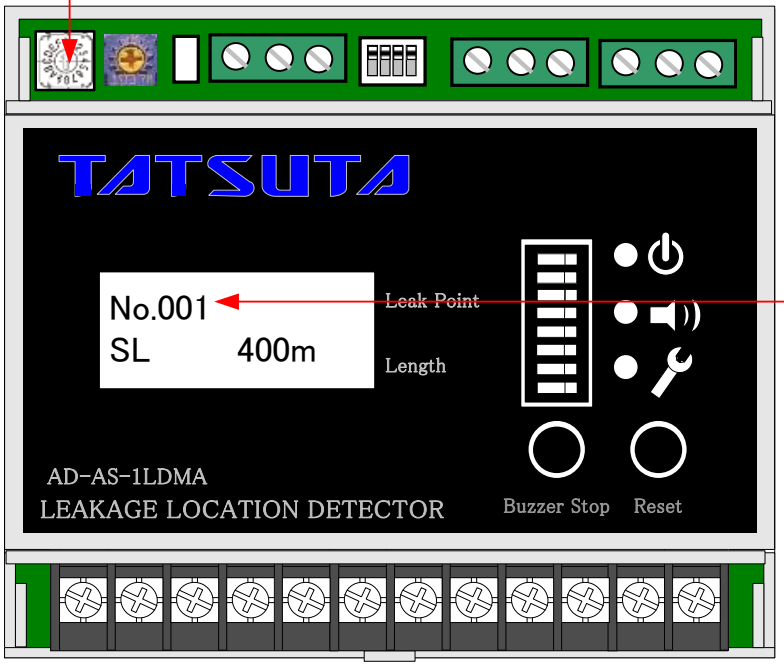
Approved by	Checked by	Prepared by	Scale	–/–
			Unit	mm
			Prepared on	2014.12.01

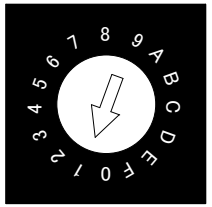
TATSUTA Electric Wire & Cable Co., Ltd.

Water Leakage Location Detector (AD-AS-1 LDMA) Explanation of the indicator 1

Attached Drawing 5

Method of setting a Modbus Address ①





To set a Modbus Address, operate the rotary switch of the detector.
The addresses that can be set are from 1 to 15.
The address corresponding to a dial is as follows:

Addresses "1" to “9”: Dials “1” to “9”
Address “10”: Dial “A”
Address “11”: Dial “B”
Address “12”: Dial “C”
Address “13”: Dial “D”
Address “14”: Dial “E”
Address “15”: Dial “F”

To set an address between 16 and 127, set the dial at “0 and then use the buzzer stop switch and the res”et switch. For more information, refer to the next page.

Note that assigning identical addresses to the same communication line causes a communication disturbance.

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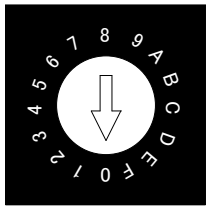
Approved by	Checked by	Prepared by	Scale	–/–
			Unit	mm
			Prepared on	2014.12.01

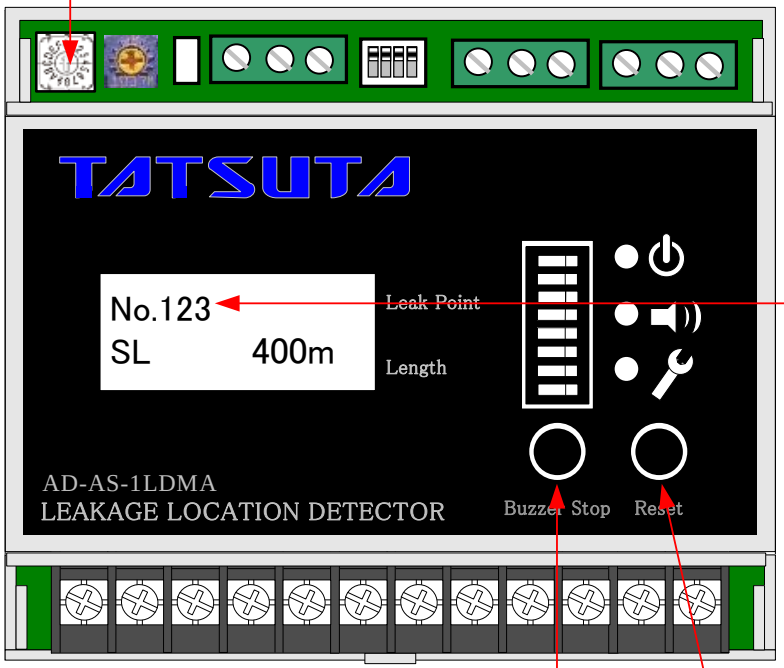
TATSUTA Electric Wire & Cable Co., Ltd.

Water Leakage Location Detector (AD-AS-1 LDMA) Explanation of the indicator 2

Attached Drawing 6

Method of setting a Modbus Address②
Case where the address is set at 16 or greater





Setting steps
① Set the rotary switch of the detector at “0.”

②Hold down the Buzzer Stop and Reset switch for at least two seconds. The setting screen appears.

③Select the digit with the Buzzer Stop switch. The number on the selected digit flashes.

④Using the Reset switch, allow the desired number to appear. Each time you push the switch, the figure increases one by one in order: 0→1→2→3→4→5→6→7→8→9→0.

⑤When the address you desire is indicated, press and hold the “Buzzer Stop” switch for at least 2 seconds. This concludes the setting and the address will be indicated after “No.”

Note that assigning identical addresses to the same communication line causes a communication disturbance.

Button for adjusting the number

Selection of the number of digits/selector button

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Approved by	Checked by	Prepared by	Scale	–/–
			Unit	mm
			Prepared on	2014.12.01

TATSUTA Electric Wire & Cable Co., Ltd.

Water Leakage Location Detector (AD-AS-1 LDMA) Explanation of the indicator 3